

## 7.7 Future Value of an Ordinary Annuity

When people invest, they usually do not simply deposit one lump sum and wait several years for it to earn interest. Most wise investors make regular payments, often deducted directly from their paycheques. Investments of this type are called annuities.

### Define:

**Annuity:** - a series of equal deposits or payments made at regular intervals.

**Ordinary annuity:** - is an annuity in which the payments are made at the end of each interval.

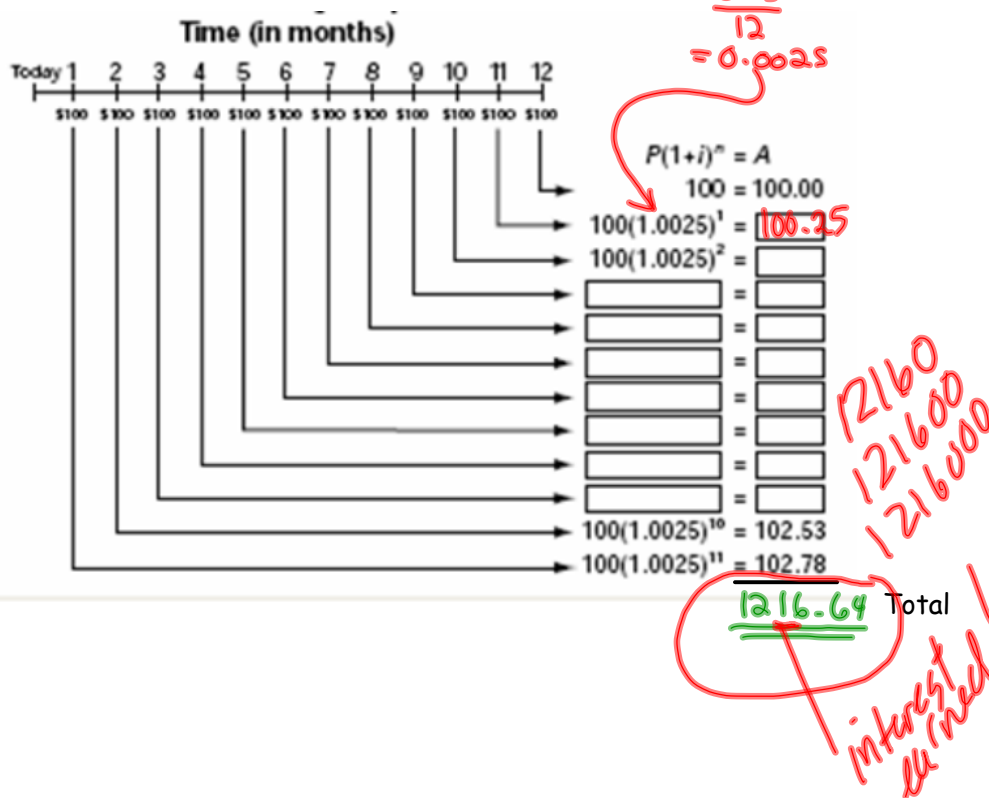
**Simple (Regular) Annuity:** - is an annuity in which the payments coincide with the compounding period.

**All problems are at the end - Ordinary Simple Annuities.**

**\*\*Payments and compound periods happen at the same time\*\***

### Method 1: Use a time line diagram

Kira deposits \$100 at the end of each month into a savings account that earns 3%/a compounded monthly. What will her savings be at the end of 1 year?



**Method 2: Use a Formula**

Kira deposits \$100 at the end of each month into a savings account that earns 3%/a compounded monthly. What will her savings be at the end of 1 year?

where:

A is the future Amount in \$

R is the regular deposit

i is interest rate per period

n is total the number of deposits

$$A = \frac{R[(1+i)^n - 1]}{i}$$

$$= \frac{100 \left( \left( 1 + \frac{0.03}{12} \right)^{12} - 1 \right)}{\left( \frac{0.03}{12} \right)}$$

$$= 1216.63$$

**Method 3: Use a Graphing Calculator**

Kira deposits \$100 at the end of each month into a savings account that earns 3%/a compounded monthly. What will her savings be at the end of 1 year?

Step 1: Press **(MODE)** and set the number of decimal places to 2:



Step 2: Press **(APPS)** 1 1 to open the TVM Solver:



Step 3: Enter the values of the variables as shown.

What the variables represent:

N (Number of Payments)

I% (Annual Interest Rate)

PV (Present Value)

PMT (Payment)

FV (Future Value)

P/Y (Number of Payments/Year)

C/Y (Number of Compounding Periods/Year)

PMT: END BEGIN (Payments at End of Payment Interval)

N = 12  
I% = 3  
PV = 0  
PMT = -100  
FV = ?  
P/Y = 12  
C/Y = 12  
PMT: END BEGIN

Will always match while doing simple annuities

PMT is negative, because money is being paid out.  
FV=0.00 because that is the variable to be solved for.

Step 4: Cursor to FV=0.00, and then, press **(ALPHA)** **(ENTER)** to solve for FV:

Examples:

$$A = \frac{R[(1+i)^n - 1]}{i}$$

Determine the amount of each annuity.

- a) Regular deposits of \$500 every ~~6 months~~<sup>2</sup> for 4 years at 8%/a compounded semi-annually.

$$= \frac{500 \left[ \left( 1 + \frac{0.08}{2} \right)^8 - 1 \right]}{0.04}$$

$$= 4607.11$$

- b) Regular deposits of \$200 every month for 8 years at 10%/a compounded monthly.

$$= \frac{200 \left[ \left( 1 + \frac{0.10}{12} \right)^{96} - 1 \right]}{\frac{0.10}{12}}$$

$$= 29236.22$$

